

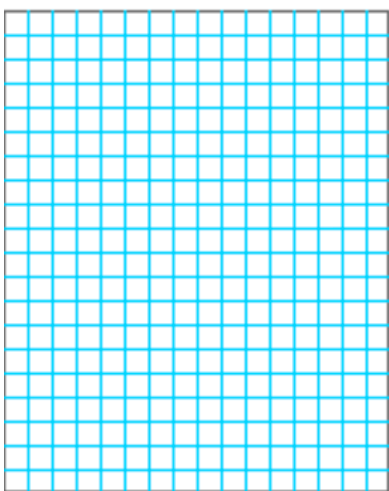
Parametric Equations

Complete the following table for the pair of equations:

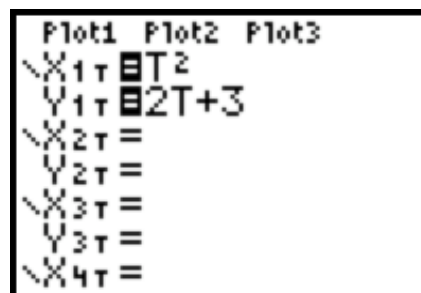
$$\begin{aligned} x &= t^2 \\ y &= 2t + 3 \end{aligned} \quad \text{for } -3 \leq t \leq 3$$

t	-3	-2	-1	0	1	2	3
x							
y							

Graph these results.



Switch your calculator into parametric mode by pressing **MODE** and selecting **PAR**. When you press **Y=**, you will now see two areas to enter your parametric equations. Enter the two equations and set your window, using the table above.



What do you notice about the graph? What happens when you switch the equations to $x = 2t + 3$ and $y = t^2$?

Further exploration:

Graph $\begin{matrix} x = \sin t \\ y = \cos t \end{matrix}$ in your graphing calculator for $0 \leq t \leq 2\pi$. To set up your window this time, first press ZOOM, then go to ZoomFit. When this graphs, go back to ZOOM and press ZSquare. Pay attention to how the graph is graphed on your calculator. Where did it start graphing? What graph does it give you? Why do you think so?

Now, switch the equations again so you have $\begin{matrix} x = \cos t \\ y = \sin t \end{matrix}$. Where did it begin graphing this time? What happens when you press trace and enter values such as $\pi, \frac{\pi}{2}, \frac{3\pi}{4}, \text{etc.}$? How could this graph be helpful to you?

Let's explore some more:

Try graphing these and recording what you find.

1. $\begin{matrix} x = 2 \sin t \\ y = 3 \cos t \end{matrix}$ and $\begin{matrix} y = 3 \cos t \\ x = 2 \sin t \end{matrix}$ for $0 \leq t \leq 2\pi$

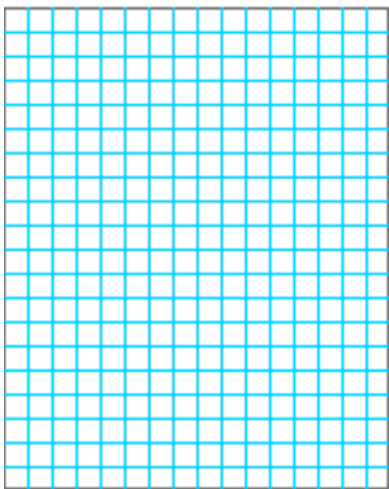
2. $\begin{matrix} x = 2t \\ y = t^2 - 1 \end{matrix}$ and $\begin{matrix} x = t^2 - 1 \\ y = 2t \end{matrix}$ for $-1 \leq t \leq 2, -4.7 \leq x \leq 4.8, -2.1 \leq y \leq 4.2$

3. $\begin{matrix} x = \sin 2t \\ y = \cos t \end{matrix}$ and $\begin{matrix} x = \cos t \\ y = \sin 2t \end{matrix}$ for $0 \leq t \leq 2\pi$

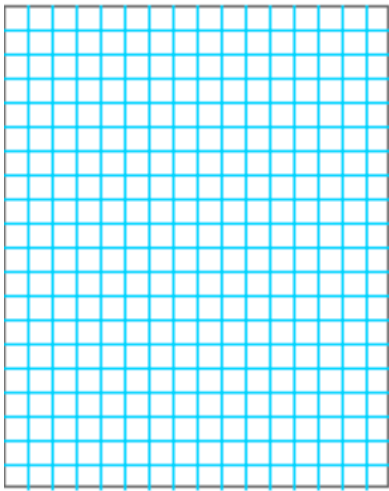
So, what are parametric equations?

Homework: These problems. Sketch a graph of each, and by “sketch”, I mean, “Be as accurate as you can!”

1. $\begin{matrix} x = 3\sin^5 t \\ y = 3\cos^5 t \end{matrix}$ for $0 \leq t \leq 2\pi$



2.
$$\begin{aligned} x &= 8 \cos t - 2 \cos 4t \\ y &= 8 \sin t - 2 \sin 4t \end{aligned} \quad \text{for } 0 \leq t \leq 2\pi$$



3.
$$\begin{aligned} x &= 3t - 2 \sin t \\ y &= 3 - 2 \cos t \end{aligned} \quad \text{for } -8 \leq t \leq 8, -20 \leq x \leq 20, -5 \leq y \leq 5$$

